CALIFORNIA ENERGY COMMISSION

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2013 BUILDING ENERGY EFFICIENCY STANDARDS

CALIFORNIA CODE OF REGULATIONS

Title 24, Part 6, and Associated Administrative Regulations in Part 1

And Reference Appendices

(CALIFORNIA ENERGY CODE)

CALIFORNIA ENERGY COMMISSION

DOCKET NUMBER 12-BSTD-1

NONSUBSTANTIAL ERRATA

JUNE 2014

Explanation

This erratum identifies edits to the Building Energy Efficiency Standards adding clarity and correcting inconsistent language.

Edits to the Energy Code

PART 6, EXCEPTION to **Section 141.0(b)2Ai**

Explanation:

Substituted the word "fenestration" for "components" for clarity.

Errata:

i. For all nonresidential, high-rise residential, and hotel/motel occupancies, when fenestration is altered or where there are alterations that do not increase the fenestration area, all altered ~~components~~ fenestration shall meet the requirements of TABLE 141.0-A. When new fenestration area is added to alterations it shall meet the requirements of TABLE 140.3-B, C or D.

PART 6, Section 150.1(c)12

Explanation:

Change inconsistent numbering

Errata:

Ventilation Cooling. Single family homes shall comply with the Whole House Fan (WHF) requirements shown in TABLE 150.1-A. When a WHF is required, comply with Subsections A.~~i~~ through C.~~iii~~ below:

A. Have installed one or more WHFs whose total Air Flow CFM as listed in the CEC Directory is at least 2 CFM/ft^2 of conditioned floor area; and

B. Have at least 1 square foot of attic vent free area for each 375 CFM of rated whole house fan Air Flow CFM; and

C. Provide homeowners who have WHFs with a one page "How to operate your whole house fan" informational sheet.

Edits to the Reference Appendices

JOINT APPENDICES

JA 2.1.1 ***Counties and Cities with Climate Zone Designations***

Explanation:

Corrected the Climate Zone for Ojai from Climate Zone 16 to climate Zone 9.

Errata:

Table 2-2 Counties and Cities with Climate Zone Designations

Ojai	93023	Ventura	9 ~~16~~

Table 2-3 Design Day Data for California Cities

					Cooling													Heating	
					0.10%		0.50%		1.00%		2.00%								
City	Climate Zone	Latitude	Elevation (ft)	Longitude	DB	MCWB	DB	MCWB	DB	MCWB	DB	MCWB	Design Wetbulb 0.1%	Design Wetbulb 0.5%	Outdoor Daily Range	Winter Median of Extremes	Design Drybulb (0.2%)	Design Drybulb (0.6%)	HDD*
[…]																			
Ojai	~~16~~9	34.5	750	119.3	102	71	97	69	95	69	91	68	73	71	38	25	29	32	2145

JA 4, Table 4.2.3 *U-factors of Structurally Insulated Panels (SIPS) Roof/Ceiling*s

Explanation:

For informational purposes, additional higher performing SIPS panels with higher R-Values have been added showing their corresponding and thermodynamically equivalent U-factor..

Errata:

Table 4.2.3 – U-factors of Structurally Insulated Panels (SIPS) Roof/Ceilings

Wood Framing Connection Type (spline)	Insulation Core R-value[1]	Typical Panel Thickness		Rated R-value of Continuous Insulation [4,5]					
				None	R-2	R-4	R-5	R-7	R-8
				A	B	C	D	E	F
OSB	R-22	6.5 in	**1**	0.041	0.038	0.035	0.034	0.032	0.031
Single 2x	R-22	6.5 in	**2**	0.044	0.040	0.037	0.036	0.033	0.032
Double 2x	R-22	6.5 in	**3**	0.046	0.042	0.038	0.037	0.034	0.033
I-joist	R-22	6.5 in	**4**	0.043	0.039	0.036	0.035	0.033	0.032
OSB	R-28	8.25 in	**5**	0.033	0.031	0.029	0.028	0.027	0.026
Single 2x	R-28	8.25 in	**6**	0.034	0.032	0.030	0.029	0.027	0.027
Double 2x	R-28	8.25 in	**7**	0.037	0.034	0.031	0.030	0.028	0.028
I-joist	R-28	8.25 in	**8**	0.033	0.310	0.029	0.028	0.027	0.026
OSB	R-33[2]	6.5 in	**9**	0.030	0.027	0.026	0.025	0.024	0.023
Single 2x	R-33[2]	6.5 in	**10**	0.031	0.029	0.027	0.026	0.025	0.024
Double 2x	R-33[2]	6.5 in	**11**	0.034	0.031	0.029	0.028	0.026	0.025
I-joist	R-33[2]	6.5 in	**12**	0.031	0.028	0.027	0.026	0.025	0.024
OSB	R-36	10.25 in	**13**	0.026	0.025	0.024	0.023	0.022	0.022
Single 2x	R-36	10.25 in	**14**	0.028	0.026	0.025	0.024	0.023	0.022
Double 2x	R-36	10.25 in	**15**	0.029	0.028	0.026	0.025	0.024	0.023
I-joist	R-36	10.25 in	**16**	0.027	0.025	0.024	0.023	0.022	0.022
OSB	R-44	12.25 in	**17**	0.021	0.020	0.019	0.019	0.018	0.018
Single 2x	R-44	12.25 in	**18**	0.023	0.022	0.021	0.021	0.020	0.019
Double 2x	R-44	12.25 in	**19**	0.025	0.023	0.022	0.022	0.021	0.020
I-joist	R-44	12.25 in	**20**	0.022	0.021	0.020	0.020	0.019	0.019
OSB	R-55[3]	10.25 in	**21**	0.017	0.016	0.016	0.016	0.016	0.016
Single 2x	R-55[3]	10.25 in	**22**	0.019	0.018	0.018	0.018	0.017	0.016
Double 2x	R-55[3]	10.25 in	**23**	0.021	0.020	0.019	0.019	0.018	0.017
I-joist	R-55[3]	10.25 in	**24**	0.018	0.017	0.017	0.017	0.016	0.016
Steel Framing	R-14	48 in	**25**	0.075	0.065	0.058	0.055	0.049	0.047
	R-22	48 in	**26**	0.057	0.051	0.046	0.044	0.041	0.039
	R-28	48 in	**27**	0.047	0.043	0.040	0.039	0.035	0.034
	R-36	48 in	**28**	0.043	0.040	0.037	0.036	0.033	0.032

RESIDENTIAL APPENDICES

RA2.2, Table 2-1 *Summary of Measures Requiring Field Verification and Diagnostic Testing*

Explanation:

Deleted “Ice Storage Air Conditioners” from Table RA2-1, Summary of Measures Requiring Field Verification and Diagnostic Testing. This technology is a commercial building technology that is not used in residential buildings. Consequently, the public domain software used to demonstrate compliance with the Standards does not include programming for modeling ice storage systems for residential buildings. Without the programming in the compliance software, there is no use for the results of FV&DT and therefore no basis for requiring FV&DT. Deleting the requirement to perform FV&DT does not prohibit or otherwise affect installation of this technology, and therefore does not have a substantive effect.

Errata:

Table RA2-1 – Summary of Measures Requiring Field Verification and Diagnostic Testing

Measure Title	Description	Procedure(s)
~~Ice Storage Air Conditioners~~	~~Compliance Credit can be taken for installation of distributed energy storage equipment. Field verification of duct sealing is required. Field verification of refrigerant charge is required.~~	~~RA3.1.4.3, RA3.2, RA3.4.3. RA3.4.4.1~~

NONRESIDENTIAL APPENDICES

NA 6.1 ***Scope***

Explanation:

Deleted typographical errors and clarified wording and punctuation.

Errata:

(a) NONRESIDENTIAL

For Nonresidential ~~up to 1,000 ft² in area of~~ site-built fenestration up to 1,000 ft² in area, other than ~~a~~ repair or replacement glass, the Alternate Default Fenestration Procedure shall be used when no NFRC Label Certificate is available. The manufacturer cut sheet or data sheet shall be used to identify the COG values for the U-factor~~e~~, Solar Heat Gain Coefficient (SHGC$_C$) and Visible Transmittance (VT$_C$).

[…]

(b) RESIDENTIAL

For Residential special cases, the Alternate Default Fenestration Procedure option is available only when non-rated site-built fenestration is being installed in a residential dwelling. For Residential site-built fenestration up to 250 ft² in area or ~~0.5% times~~ 5% of the conditioned floor area (CFA), whichever is greater, shall meet Sections §110.6(a)2 and §110.6(a)3.

NA7.5.4 ***Air Economizer Controls***

Explanation:

"Lockout setpoint" is legacy language no longer used in the 2013 Building Energy Efficiency Standards.

Reference to Table 140.4 corrected.

Added term "fixed enthalpy + fixed dry bulb" to match the wording in the 2013 Building Energy Efficiency Standards.

Primary damper control temperature sensor location is not specified in the 2013 Building Energy Efficiency Standards.

Sections 140.4(e)2Bi and ii were recommended additions to the language that were never added to during the Rulemaking process and so references to those non-existent sections are being removed.

Corrected actuation specifications to match the 2013 Building Energy Efficiency Standards.

Reference to direct drive modulating actuator with gear driven interconnections was removed from the 2013 Building Energy Efficiency Standards and therefore removed.

Lettering/numbering was updated.

Errata:

NA7.5.4.1 ***Construction Inspection***

Prior to Functional Testing, verify and document the following:

(a) Economizer ~~lockout setpoint~~ high limit shutoff control complies with Table 140.4 B ~~(e) C~~ of Section140.4(e)3.

(b) If the high-limit control is fixed dry-bulb or fixed enthalpy + fixed dry-bulb, it shall have an adjustable setpoint.

(c) Economizer lockout control sensor is located to prevent false readings.

(d) Sensor performance curve is provided by factory with economizer instruction material.

(e) Sensor output value measured during sensor calibration is plotted on the performance curve.

~~(f) Primary damper control temperature sensor located after the cooling coil to maintain comfort.~~

(f) ~~(g)~~ Economizer damper moves freely without binding.

(g) ~~(h)~~Unitary systems with an economizer have control systems, including two-stage or electronic thermostats, that cycle compressors off when economizers can provide partial cooling

(h) ~~(i)~~ Economizer reliability features are present per Standards Section 140.4(e)4.

(i) ~~(j)~~ System is designed to provide up to 100 percent outside air without over-pressurizing the building.

(j) ~~(k)~~ For systems with DDC controls lockout sensor(s) are either factory calibrated or field calibrated.

(k) ~~(l)~~ For systems with non-DDC controls, manufacturer's startup and testing procedures have been applied.

~~(m) For direct expansion systems 65,000 Btu/hr and less, thermostats (e.g. two stage or electronic) and control system has capacity to modulate compressor or cycle compressor off during periods where economizer cooling can partially meet the cooling load as per Section 140.4(e)2.B.i.~~

~~(n) For direct expansion systems, equipment submittal specifies compressor capacity steps and/or compressor capacity modulation complying with the stages or modulation required in Section 140.4(e)2.B.ii.~~

(l) ~~(o)~~ Provide an economizer specification sheet proving capability of at least 60~~100~~,000 actuations.

(m) ~~(p)~~ Provide a product specification sheet proving compliance with AMCA Standard 500 damper leakage at 10 cfm/sf.

~~(q) Unit has a direct drive modulating actuator with gear driven interconnections.~~

NA7.5.4.2 ***Functional Testing***

Explanation:

Sections 140.4(e)2Bi and ii were recommended additions to the language that were never added to during the Rulemaking process and so reference to those sections are being removed.

Errata:

Functional Testing

Step 1: Disable demand control ventilation systems (if applicable).

Step 2: Enable the economizer and simulate a cooling demand large enough to drive the economizer fully open. Verify and document the following:

(a) Economizer damper is 100 percent open and return air damper is 100 percent closed.

~~(b) For systems that meet the criteria of §140.4(e)2.B.i, verify that the economizer is 100 percent open part of the time and the compressor cycles on and off when the cooling demand can no longer be met by the economizer alone.~~

~~(c) For systems that meet the criteria of §140.4(e)2.b.ii, verify that the economizer provides partial cooling even when additional mechanical cooling is required to meet the remainder of the cooling load.~~

(b) ~~(d)~~ All applicable fans and dampers operate as intended to maintain building pressure.

(c) ~~(e)~~ The unit heating is disabled (if unit has heating capability).

Step 3: Disable the economizer and simulate a cooling demand. Verify and document the following:

(d) ~~(f)~~ Economizer damper closes to its minimum position.

(e) ~~(g)~~ All applicable fans and dampers operate as intended to maintain building pressure.

(f) ~~(h)~~ The unit heating is disabled (if unit has heating capability).

Step 4: If unit has heating capability, simulate a heating demand and set the economizer so that it is capable of operating (i.e. actual outdoor air conditions are below lockout setpoint). Verify the following:

(g) ~~(i)~~ The economizer is at minimum position

(h) Return air damper opens.

Step 5: Turn off the unit. Verify and document the following:

(i) ~~(j)~~ Economizer damper closes completely.

Step 6: Restore demand control ventilation systems (if applicable) and remove all system overrides initiated during the test.

NA7.5.14. ***Thermal Energy Storage***

Explanation:

The Thermal Energy Storage Protocol in the 2008 Nonresidential Appendices asked for output data from DOE2 software, which will no longer be used as building simulation software for the 2013 Building Energy Efficiency Standards. Changes to the protocol are needed to make the procedure useful in the field and pertain to all Thermal Energy Storage applications.

Errata:

NA7.5.14. ***Thermal Energy Storage***

The following acceptance tests apply to thermal energy storage systems that are used in conjunction with chilled water air conditioning systems.

NA7.5.14.1 ***Eligibility Criteria***

The following types of TES systems are eligible for compliance credit:

(a) Chilled Water Storage

(b) Ice-on-Coil Internal Melt

(c) ~~(d)~~ Ice-on-Coil External Melt

(d) ~~(e)~~ Ice Harvester

(e) ~~(d)~~ Brine

(f) ~~(e)~~ Ice-Slurry

(g) ~~(f)~~ Eutectic Salt

(h) ~~(g)~~ Clathrate Hydrate Slurry (CHS)

(i) Cryogenic

(j) Encapsulated (e.g. Ice Balls)

The following Certificate of Compliance information for both the chiller and the storage tank shall be provided on the plans to document the key TES System parameters and allow plan check comparison to the inputs used in ~~the DOE-2 simulation. DOE-2 keywords are shown in ALL CAPITALS in parentheses~~ the compliance software.

Chiller:

(k) ~~(h)~~ Brand and Model

(l) ~~(i)~~ Type (Centrifugal, Reciprocating, Other)

(m) Heat Rejection Type (Air, Water, Other)

(n) Charge Mode Capacity (Tons)

(o) Discharge Mode Capacity (Tons)

~~(i) Capacity (tons) (SIZE)~~

~~(k) Starting Efficiency (kW/ton) at beginning of ice production (COMP KW/TON START)~~

~~(l) Ending Efficiency (kW/ton) at end of ice production (COMP KW/TON/END)~~

~~(m) Capacity Reduction (% / °F) (PER – COMP REDUCT/F)~~

(p) Discharge Mode Efficiency (kW/Ton or EER)

(q) Charge Mode Efficiency (kW/Ton or EER)

(r) Fluid Type and Percentage

Storage Tank:

(t) ~~(n)~~ Brand and Model ~~Storage Type (TES-TYPE)~~

(u) ~~(o)~~ Number of Tanks ~~(SIZE)~~

(v) ~~(p)~~ Storage Capacity per Tank (ton-hours) ~~(SIZE)~~

(w) ~~(q)~~ Storage Rate (tons) ~~(COOL=STORE-RATE)~~

(x) Minimum Charging Temperature

(y) ~~(r)~~ Discharge Rate (tons) ~~(COOL=SUPPLY-RATE)~~

~~(s) Auxiliary Power (watts) (PUMPS + AUX KW)~~

~~(t) Tank Area (CTANK – LOSS - COEFF)~~

~~(u) Tank Insulation (R Value) (CTANK - LOSS COEFF)~~

NA7.5.14.2 ***Functional Testing***

Acceptance testing also shall be conducted and documented on the Certificate of Acceptance in two parts:

In the TES System Design Verification part, the installing contractor shall certify the following information, which verifies proper installation of the TES System consistent with system design expectations:

(a) Chiller(s) start-up procedure has been completed

(b) System fluid test and balance has been completed

(c) Air separation and purge has been completed

(d) Fluid (e.g. glycol) has been verified at the concentration and type indicated on the design documents

(e) The TES system has been fully charged at least once and charge duration noted

(f) The system has been partially discharged at least once and discharge duration noted

(g) The system is in a partial charge state in preparation for step 2 tests

(h) Schedule of operation has been activated as designed

(i) Mode documentation describes the state of system components in each mode of operation.

~~(a) The TES system is one of the above eligible systems.~~

~~(b) Initial charge rate of the storage tanks (tons).~~

~~(c) Final charge rate of the storage tank (tons).~~

~~(d) Initial discharge rate of the storage tanks (tons).~~

~~(e) Final discharge rate of the storage tank (tons).~~

~~(f) Charge test time (hrs).~~

~~(g) Discharge test time (hrs).~~

~~(h) Tank storage capacity after charge (ton-hrs).~~

~~(i) Tank storage capacity after discharge (ton-hrs).~~

~~(j) Tank standby storage losses (UA).~~

~~(k) Initial chiller efficiency (kW/ton) during charging.~~

~~(l) Final chiller efficiency (kW/ton) during charging.~~

In the TES System Controls and Operation Verification part, the installing contractor also shall complete the following acceptance testing to ensure the TES System is controlled and operates consistent with the compliance simulation. The installing contractor shall convey the results of the testing to the enforcement agency using the Certificate of Acceptance.

(a) Verify that the TES system and the chilled water plant is controlled and monitored by an energy management system (EMS).

(b) Indicate the method of simulation that will be used during the test. Either manual selection of each operating mode or the use of an EMS by inputting the schedule as indicated by the designer.

~~(b)~~ (c) Storage/charge mode. Manually select storage mode. Verify that the TES system stores energy. If scheduled, input the time interval that would result in storage/charge mode. Verify that the TES system stores energy. ~~Force the time to be between 9:00 p.m. and 9:00 a.m. and simulate a partial or no charge of the tank and simulate no cooling load by setting the indoor temperature setpoint higher than the ambient temperature. Verify that the TES system starts charging (storing energy).~~

(d) End of charge signal. Simulate a full storage charge by changing the (manufacturer recommended) thermal storage end of charge output ~~of the~~ sensor to the EMS. Verify that the storage charging has stopped.

~~(c)~~ (e) Discharge mode. Generate a call for cooling. Manually select storage only discharge mode. Verify that the TES system starts discharging with the compressors off. Return to the off/secured mode. If scheduled, input the time interval that would result in discharge mode and verify that the storage starts discharging with the compressors off. ~~Force the time to be between 6:00 p.m. and 9:00 p.m. and simulate a partial charge on the tank and simulate a cooling load by setting the indoor temperature setpoint lower than the ambient temperature. Verify that the TES system starts discharging.~~

(f) Mechanical cooling only mode. Generate a call for cooling. Manually select mechanical cooling only mode and verify that the storage does not discharge and the cooling load is met by the compressor only. Return to the off/secure mode. If scheduled, input the time interval that would result in mechanical cooling only mode and verify that the storage does not discharge and the cooling load is met by the compressor only.

~~(d)~~ (g) Discharge and mechanical cooling mode. Generate a call for cooling. Manually select discharge and mechanical cooling mode and verify that the TES system discharges with the compressor sharing the load. If scheduled, input the time interval that would result in discharge and mechanical cooling mode and verify that the storage starts discharging with the compressor sharing the load. ~~Force the time to be between noon and 6:00 p.m. and simulate a cooling load by lowering the indoor air temperature setpoint below the ambient temperature. Verify that the tank starts discharging and the compressor is off.~~

~~(e). Force the time to be between 9:00 a.m. to noon, and simulate a cooling load by lowering the indoor air temperature setpoint below the ambient temperature. Verify that the TES systemtank does not discharge and the cooling load is met by the compressor only.~~

~~(f) Force the time to be between 9:00 p.m. and 9:00 a.m. and simulate a full tank charge by changing the sensor that indicates tank capacity to the Energy Management System so that it indicates a full tank capacity. Verify that the tank charging is stopped.~~

(h) Off/storage-secured mode. Manually select the off/storage-secured mode and verify that the storage does not discharge and all compressors are off, regardless of the presence of calls for cooling. If scheduled, input the time interval that would result in off/storage-secured mode and verify that the storage does not discharge and all compressors are off, regardless of the presence of calls for cooling. ~~Force the time to be between noon and 6:00 p.m. and simulate no cooling load by setting the indoor temperature setpoint above the ambient temperature. Verify that the TES systemtank does not discharge and the compressor(s) isare off.~~

~~(g)~~ (i) Charge plus cool mode. If provisions for this mode have been made by the system designer, verify that the tank(s) can be charged while serving an active cooling load, simulated by generating a call for cooling and entering the charge mode either manually or by time schedule. If the system~~s~~ disallows this mode of operation, verify that the energy storage is disallowed or discontinued while an active cooling load is present.